WE CLAIM:

1. A transparent glass-ceramic containing a predominant crystal phase of forsterite, the glass-ceramic having a composition, in weight percent on an oxide basis, consisting essentially of about:

40-60% SiO_2;

10-25% Al_2O_3;

18-30% MgO;

3-10% Na_2O;

0-10% K_2O;

>5-15% TiO_2; and

said glass-ceramic has a crystallinity of at least about 30% by weight of forsterite components at a liquidus temperature of about 1525°C or below.

2. The glass-ceramic according to claim 1, wherein Na_2O and K_2O are both present in about a 1:1 molar ratio.

3. The glass-ceramic according to claim 1, wherein said TiO_2 content by weight in said composition is greater than about 6%, and less than about 9%.

4. The glass-ceramic according to claim 1, wherein said composition further includes, in weight percent on an oxide basis, up to about 1.3% chromium oxide.

5. The glass-ceramic according to claim 4, wherein said composition includes, in weight percent on an oxide basis, about 0.05% to about 0.75% chromium oxide.

6. The glass-ceramic according to claim 1, wherein said composition further includes, in weight percent on an oxide basis, up to about 20% GeO_2.

7. The glass-ceramic according to claim 1, wherein said composition includes a transition metal ion selected from the group consisting of Ni^{2+}, V^{3+}, Co^{2+}, Cr^{4+}, Cu^{2+}, Cu^{1+}, Mn^{2+}, Fe^{2+}, and Ti^{3+}.

8. The glass-ceramic according to claim 1, wherein said crystallinity is about 35% or more by weight of forsterite components.

9. The glass-ceramic according to claim 1, wherein crystals in the crystal phase have a size no larger than about 60 nm.

10. The glass-ceramic according to claim 1, wherein crystals in the crystal phase have a size between about 10 nm to about 35 nm.

11. A transparent glass-ceramic with a crystallinity of at least about 30% by weight of forsterite components at a liquidus temperature of about 1525°C or below, having a composition, in weight percent on an oxide basis, consisting essentially of about:

43-55% SiO_2;
11-16% Al_2O_3;
20-26% MgO;
3.5-6.5% Na_2O;
3.0-8.0% K_2O;
5.5-9.0% TiO_2.

12. The glass-ceramic according to claim 11, wherein Na_2O and K_2O are both present in about a 1:1 molar ratio.

13. The glass-ceramic according to claim 11, wherein said TiO_2 content by weight in said composition is greater than about 6%, and less than about 9%.

14. The glass-ceramic according to claim 11, wherein said composition further includes, in weight percent on an oxide basis, up to about 1.3% chromium oxide.

15. The glass-ceramic according to claim 14, wherein said composition includes, in weight percent on an oxide basis, about 0.05% to about 0.7% chromium oxide.

16. The glass-ceramic according to claim 11, wherein said composition further includes, in weight percent on an oxide basis, up to about 20% GeO_2.

17. The glass-ceramic according to claim 11, wherein said composition includes a transition metal ion selected from the group consisting of Ni^{2+}, V^{3+}, Co^{2+}, Cu^{2+}, Cu^{1+}, Mn^{2+}, Fe^{2+}, and Ti^{3+}.

18. The glass-ceramic according to claim 11, wherein said crystallinity is about 35% or more by weight of forsterite components.

19. The glass-ceramic according to claim 11, wherein crystals in the crystal phase have a size no larger than about 60 nm.

20. The glass-ceramic according to claim 11, wherein crystals in the crystal phase have a size between about 10 nm to about 35 nm.

21. A method of dissolving at least 30 % by weight of forsterite component in a glass-ceramic, the method comprising:

providing a R_2O-MgO-Al_2O_3-SiO_2 glass composition, wherein R is an alkali ion, containing, in weight percent, at least about 3% of Na_2O coupled with greater than 5% of TiO_2;

melting said glass at a temperature between about 1575°C to about 1650°C.

22. The method according to claim 21, wherein said glass has a composition, in weight percent on an oxide basis, consisting essentially of about: 40-60% SiO_2; 10-25% Al_2O_3; 18-30% MgO; 3-10% Na_2O; 0-10% K_2O; >5-15% TiO_2.

23. The method according to claim 21, further comprising achieving at least 30 % by weight of forsterite component in said glass-ceramic at a liquidus temperature of about 1525°C or below.

24. The method according to claim 22, wherein Na_2O and K_2O are both present in about a 1:1 molar ratio.

25. The method according to claim 22, wherein said TiO_2 content by weight in said composition is greater than about 6%, and less than about 9%.

26. The method according to claim 22, wherein said composition further includes, in weight percent on an oxide basis, up to about 1.3% chromium oxide.

27. The method according to claim 26, wherein said composition includes, in weight percent on an oxide basis, about 0.05% to about 0.7% chromium oxide.

28. The method according to claim 22, wherein said composition further includes, in weight percent on an oxide basis, up to about 20% GeO_2.

29. The method according to claim 22, wherein said composition includes a transition metal ion selected from the group consisting of Ni^{2+}, V^{3+}, Co^{2+}, Cr^{4+}, Cu^{2+}, Cu^{1+}, Mn^{2+}, Fe^{2+}, and Ti^{3+}.

30. The method according to claim 22, wherein said crystallinity is about 35% or more by weight of forsterite components.

31. The method according to claim 22, wherein crystals in the crystal phase have a size no larger than about 60 nm.

32. The method according to claim 22, wherein crystals in the crystal phase have a size between about 10 nm to about 35 nm.

33. An optical element selected from the group consisting of an optical fiber, a gain-medium, a laser, and an amplifier, said element comprising: a transparent glass-ceramic containing a crystallinity of at least about 30% by weight of forsterite component at a liquidus temperature of about ≤ 1525°C ± 5°C or below, the glass-ceramic having a composition, in weight percent on an oxide basis, consisting essentially of about: 40-60% SiO_2; 10-25% Al_2O_3; 18-30% MgO; 3-10% Na_2O; 0-10% K_2O; and >5-15% TiO_2.

34. The optical element according to claim 33, wherein Na_2O and K_2O are both present in about a 1:1 molar ratio.

35. The optical element according to claim 33, wherein said TiO_2 content by weight in said composition is greater than about 6%, and less than about 9%.

36. The optical element according to claim 33, wherein said composition further includes, in weight percent on an oxide basis, up to about 1.3% chromium oxide.

37. The optical element according to claim 36, wherein said composition includes, in weight percent on an oxide basis, about 0.05% to about 0.7% chromium oxide.

38. The optical element according to claim 33, wherein said composition further includes, in weight percent on an oxide basis, up to about 20% GeO_2.

39. The optical element according to claim 33, wherein said composition includes a transition metal ion selected from the group consisting of Ni^{2+}, V^{3+}, Co^{2+}, Cr^{4+}, Cu^{2+}, Cu^{1+}, Mn^{2+}, Fe^{2+}, and Ti^{3+}.

40. The optical element according to claim 33, wherein said crystallinity is about 35% or more by weight of forsterite components.

41. The optical element according to claim 33, wherein crystals in the crystal phase have a size no larger than about 50 nm.

42. The optical element according to claim 33, wherein crystals in the crystal phase have a size between about 10 nm to about 35 nm.